



Levels:

Grades K-3

Subject:

- Reading
- Science

Concepts:

- Energy is the ability to do work.
- Energy can be categorized as stored energy and working energy.
- Nonrenewable energy will run out eventually.
- Renewable energy is expected to last for a long time.
- Using less energy from nonrenewable fossil fuels reduces air pollution.
- Using renewable energy is better for the environment in several key ways.
- Energy conservation is one way we can all help the environment.

Skills:

- Observing and classifying
- Listening and read-aloud experience
- Following instructions
- Using picture clues to aid in comprehension

Materials:

- Reproducible in-class presentation on energy and the environment (pp. 2-11)
- Reproducible coloring bookmarks (pp. 13-14)



Figure 1
The Energy Star Label

Overview for Activity One

This activity introduces younger students to the basic concept of energy and its impact on the environment. Terms like stored energy, working energy, electricity, energy efficiency, renewable energy, nonrenewable energy, and global climate change are briefly explored through an in-class presentation. These concepts are reinforced in a bookmark coloring project.

Background

Energy, and particularly electricity, is something many younger students take for granted. We flip the switch, and the classroom is less dark. We plug in a video game or turn on the computer, and we are entertained or educated. Someone puts the dirty clothes in the washer and dryer and voila! Our clothes are clean and dry. The list goes on. While many of your students have probably been told that they have a lot of energy, very few know what this means, or how it relates to the power we use everyday. Only a handful of your students have probably even considered the environmental impacts of using and wasting energy.

According to the U.S. Department of Energy, 68% of our country's electricity is produced from the stored energy contained in fossil fuels. These fossil fuels are being depleted faster than nature can replace them. Making electricity from fossil fuels creates air pollution and damage to land, water, and other resources. According to the Energy Star program (a joint effort between the U.S. Department of Energy and the Environmental Protection Agency), the electricity produced to supply power for the estimated 3 billion light fixtures in American homes resulted in 100 million tons of carbon dioxide (CO₂). These air emissions have been linked to the greenhouse effect and global climate change.

The picture does not have to be so bleak. The pollution created from fossil fuel mining, transport, and electricity production decreases when we use products that require less energy to do the same work. Products with the *Energy Star* label (see figure 1) have met or exceeded government specifications for energy efficiency and pollution prevention. Your students can also help the environment by taking steps to use renewable energy from the sun, wind, biomass, water, trash, and steam trapped in the earth (geothermal).

Some of these renewable energy sources require investments more suitable to a power plant or public utility. Others can be achieved through the positioning of windows and awnings or the purchase of solar panels, solar collectors, and other equipment.

Getting ready for Activity One:

1. Review the background contained in this introduction, the glossary (p. 19), and the reproducible in-class instruction sheets, (pp. 2-12).
2. Reproduce the in-class instruction sheets onto transparencies.
3. Use pages 13-14 to make a double-sided bookmark for each student in your class.

Doing Activity One:

1. Show and discuss the transparencies you made about energy and the environment (pp. 2-12)
2. Distribute the coloring bookmark(s) to your students. (see Figure 2)
3. Tell the students that they are going to color a bookmark for a friend or family member as a gift.
4. Ask the students to write the name of a friend or family member that they'd like to give it to on the back.
5. Collect the bookmarks and laminate them.
6. Return the laminated bookmarks to your students, and ask the class to share their new knowledge about saving energy and the environment with the person who receives the bookmark gift.



Figure 2
Coloring Bookmarks



Key Term Glossary

Acid rain: When sulfur dioxide and nitrogen oxides are emitted from cars and power plants, they mix with water vapor and turn into acids, which in turn, fall to the ground with rain, snow, or fog. This “acid rain” corrodes buildings, damages trees, harms vegetation and can harm or destroy aquatic life.

AMPERE (AMP): The measure of the number of electrons flowing through a wire. If electricity were water in a flowing river, the amps would be the amount of water flowing in that river. (See volt and watt.)

Analysis: An examination of a system, its elements, and their relations; or proof of a mathematical proposition by assuming a result and deducing a valid statement by a series of reversible steps as in the Scientific Method.

Ballast: A device that charges the electrical current in fluorescent lights.

Biomass: Farming wastes, grasses, trees, bark, sawdust, and other things which can be changed into energy by burning it, changing it to a gas, or by converting it to a liquid fuel.

Boiler: A pressurized vessel in which water or another liquid is heated to generate steam energy.

Carbon Dioxide (CO₂): A gas that is the product of burning fossil fuels and contributes to the greenhouse effect. It is also a naturally occurring chemical that is absorbed by plants. The molecule CO₂ has one carbon atom and two oxygen atoms.

Coal: A solid fossil fuel found in the earth that is often burned to make electricity.

Compact fluorescent lights or lamps (CFL): Fixtures that contain gas instead of wire filaments. Electrical current makes the gas atoms glow or “fluoresce.” This fluorescence creates light with very little heat. (Note: In this lesson CFL is sometimes referred to as light due to audience knowledge levels.)

Conservation: Protecting something from waste, loss, or harm. Energy conservation means using less energy, both by using more energy-efficient technologies and by changing wasteful habits.

Efficiency: The amount of work you get for the energy you use. An energy-efficient light bulb uses most of its energy to create light, not heat. An efficient power plant gets more electricity out of the coal or oil it burns and less unwanted heat or pollution.

Electricity: One of the most important forms of energy, consisting of oppositely charged electrons and protons that produce light, heat, magnetic force, and chemical change.

Energy: The product of power (watts) and time (hours) or the capacity for doing work. Energy used for lighting can be saved by either reducing the amount of power required to produce the same amount or more light (lumens).

Energy-efficiency: Getting more accomplished with less energy.

Energy-efficient lighting: Lights that produce the same amount of light (lumens) using less electricity (watts) than conventional light bulbs. Efficient lights are usually fluorescent (they don’t waste energy making unwanted heat), and they may have reflectors that direct the light where you want it.

ENERGY STAR® labeled products:

Products which have met the specifications of a joint program of the U.S. Department of Energy and the U.S. Environmental Protection Agency for energy efficiency and pollution prevention.



Fossil Fuels: Fuels such as oil, coal and natural gas, that formed millions of years ago from decayed plants and animals that contain carbon.

Fuel: A material (liquid, solid, or gas) that can be used to provide power for an engine, power plant, or nuclear reactor.

Generator: A machine that converts mechanical energy into electrical energy.

Geothermal energy: Using the heat from the earth to produce power.

Global Warming: Possible accelerated increase in the Earth’s temperature caused by excess production of greenhouse gases due, in large part, to the depletion of forests, air pollution from automobiles, making electricity via fossil fuels and burning fossil fuels for other needs.

Greenhouse Effect: The trapping of the sun’s heat. In houses and cars it can be caused by glass. In the Earth’s atmosphere it is a naturally occurring phenomenon resulting from the interaction of sunlight with greenhouse gases (such as CO₂ and CFCs). This interaction helps maintain the delicate balance of temperature and breathable air necessary for life as we know it.

Halogen torchiere: A popular, indoor, contemporary floor lamp. This light bulb uses 300-500 watts and has been identified as a potential fire hazard due to the excessive heat (750 -1000 degrees F) generated from the light produced.

Hydropower: Using the energy in flowing water to make electricity.

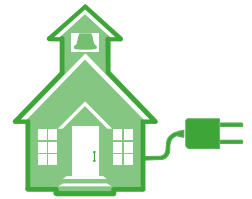
Hypothesis: Educated guess and step 3 in the Scientific Method.

Incandescent light bulbs: Light bulbs that work on the principle of electrical resistance. Electrical current flows through a wire filament, which slows or “resists” the flow of electrons. The wire gets hot and glows. Thus the incandescent bulbs create both heat and light.

Kilowatt: 1,000 watts.

Kilowatt-hour: The amount of work that can be done by one kilowatt during one hour.

Lumens: The measure of the amount of light a bulb puts out.



Key Term Glossary (continued)

Natural gas: A fossil fuel found deep in the earth—often in oil.

Nonrenewable Energy: Sources of energy that will run out such as coal, gas, oil, nuclear energy, and hydropower.

Oil: A liquid fuel found deep in the earth, which is often used to make electricity, gasoline and other products.

Passive solar house: A house that uses a room or another part of the building as a solar collector.

Photosynthesis: The process by which plants make their own energy. Plants use energy from the sun to convert carbon dioxide (gas) and water into carbohydrates (simple sugars). One of the by-products of photosynthesis is oxygen, which is used by people and other animals to breathe. As animals use energy, they exhale carbon dioxide gas, which can be absorbed up by the plants and used for photosynthesis.

Power: The ability to do or act and or the time rate at which work is performed.

Renewable Energy: Sources of Energy that will not run out, such as sun, wind, wood, biomass, and water.

Science: The organized body of knowledge that is derived from observations and can be independently verified or tested by further investigation.

Scientific Method: An organized approach to problem solving that includes collecting data, formulating a hypothesis, testing it objectively, interpreting results, and stating a conclusion that can later be independently evaluated by others.

Steam Turbine: A machine in which high-pressure steam is made to do work by acting on and rotating blades in a cylinder. Steam turbines are used in the majority of power plants that use fossil fuels to produce electricity.

Solar collectors: Boxes, frames, or rooms that trap the sun's rays to produce heat.

Solar energy: Energy from the sun (i.e. the heat that builds up in your car when it is parked in the sun).

Sulfur Dioxide (SO₂): A toxic, colorless gas which is a dangerous constituent of smog. It is formed by volcanic activity, organic decay and burning of fossil fuels.

Technology: The application of scientific know-how for practical purposes or any use of objects by humans to do work or otherwise manipulate their environment.

Volt: The measure of the force of an electrical current. If electricity were a river, the voltage would be the speed of the water's current. (See amp and watt.)

Waste to energy: Trash or methane gas from decaying food products that are burned to create steam for electricity production.

Watt-hours: The amount of work that can be done by one watt in one hour.

Watt: The measure of electric power produced. One amp multiplied by one volt equals one watt. If electricity were a river, the watts would be the amount of work the water's current could do. (See amp and volt.)

Wind power: Using the wind to produce electricity by turning blades on a wind turbine.

Wind power plant: a group of wind turbines interconnected to a common utility system.

Credits

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